REMARKS

The examiner has rejected:

I. Claims 18 and 20 under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement;

II. Claims 1 – 4, 6 – 13, 15, 17, 18 and 20 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention;

III. Claims 1 – 3, 8 – 11, 13, 15, 17, 18 and 20 under 35 U.S.C. §102(b) over Earle[1];

IV. Claims 1 – 3, 8 – 11, 13, 15, 17, 18 and 20 under 35 U.S.C. §103(a) over Earle;

V. Claims 1 – 3, 8 – 11, 13, 15, 17, 18 and 20 under 35 U.S.C. §103(a) over Earle in view of Hackh's Dictionary[2] and Kawaki[3] or Thiem[4];

VI. Claims 2, 6, 7, 9, 12, 18 and 20 under 35 U.S.C. §103(a)[5] over Earle in view of Hackh's Dictionary and Kawaki or Thiem and further in view of Snyder[6];

VII. Claims 18 and 20 under 35 U.S.C. §103(a) over Earle in view of Hackh's Dictionary and Kawaki or Thiem and Snyder, and further in view of Mikeš Handbook[7];

VIII. Claim 4 under 35 U.S.C. §103(a) over Earle in view of Hackh's Dictionary and Kawaki or Thiem and further in view of Gerhold[8];

IX. Claims 11, 18 and 20 under 35 U.S.C. §103(a) over Earle in view of Hackh's Dictionary and Kawaki or Thiem and further in view of Wasserscheid[9]; and

X. Claims 18 and 20 under 35 U.S.C. §103(a) over Earle in view of Hackh's Dictionary and Kawaki or Thiem and further in view of Wasserscheid and Snyder and Mikeš Handbook.

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[1] Earle, U.S. 2004/0025009.
[2] Hackh's Chemical Dictionary, McGraw-Hill Book, New York, 1972, page 461.
[3] Kawaki, US 5,543,474.
[4] Thiem, US 4,751,291.
[5] Please note that applicants have grouped the rejections listed on pages 4 and 7 of the Office action mailed March 22, 2007.
[6] Snyder, Introduction to Modern Liquid Chromatography, John Wiley & Sons, New York, 1979, pages 270 – 272, 285 and 410 – 411.
[7] Mikeš Laboratory Handbook of Chromatographic and Allied Methods, John Wiley & Sons, New York, 1979, pages 218 – 219.
[8] Gerhold, US 4,402,832.
[9] Wasserscheid (Ionic Liquids in Synthesis), page 17, lines 13 – 15.

Applicants are thankful for the examiner's diligent efforts to advance this application to allowance and are pleased to have this opportunity to address the examiner's concerns. Upon careful review of the following remarks, the examiner will confidently agree that the claimed invention is patentably distinct from all know prior art and that this application is in good condition for allowance.

The amendments to the claims 1, 8, 9, 17, 18, and 20 add no new matter. Likewise, new claims 21 – 24 do not add new matter.

The following phrase has been added to claim 1: "wherein the at least one impurity is a substance having a vapor pressure in the mixture that prohibits complete removal of the substance from the mixture by distillation, and/or wherein the at least one impurity is a substance that interacts with the at least one ionic liquid so as to prohibit complete removal of the substance from the mixture by distillation." This phrase finds support in the specification on page 11, indicated lines 14 – 21. An analogous phrase has been added to claims 8 and 18. These analogous phrases find support in the same portion of the specification.

Claim 9 has been amended so as to correct a misspelling. The word "absorption" has been replaced with the word "adsorption." This correction finds support throughout the specification.

Claim 17 has been amended merely to assure that proper antecedent basis remains upon the amendment of claim 8, from which claim 17 depends.

Claim 18 has been amended to require a step of "providing the contaminated ionic liquid by (a) separating volatile components from a mixture comprising the ionic liquid, the volatile components and the at least one impurity, by means of evaporation or rectification, and/or (b) separating non-polar components from a mixture comprising the ionic liquid, the non-polar components and the at least one impurity, by means of extraction with a non-polar organic solvent." Page 11, indicated lines 10 – 12 of the present specification provide clear support for step (a), and page 11, indicated lines 23 – 35 provide clear support for step (b). The overall phrase finds clear support on page 11, indicated lines 10 – 35, which makes clear that the present invention is directed to

purifying an ionic liquid that remains contaminated even though steps (a) and (b) are performed.

Claim 20 has been amended merely to assure that proper antecedent basis remains upon the amendment of claim 18, from which claim 20 depends.

New claim 21 finds support in claim 5 as originally presented. New claims 22 and 23 find support in the specification on page 11, indicated lines 17 – 18. New claim 24 finds support in the specification on page 11, indicated lines 16 – 18.

In light of the discussion above, applicants request that the examiner enter and consider the amendments, and that the examiner also withdraw the rejection of claims 18 and 20 under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement.

In light of the claim amendments, applicants request that the examiner withdraw the rejection of claims 1 – 4, 6 – 13, 15, 17, 18 and 20 under 35 U.S.C. §112, second paragraph. The phraseology, which the examiner alleged to be indefinite, is no longer used.

The examiner can confidently withdraw the rejection of claims 1 – 3, 8 – 11, 13, 15, 17, 18 and 20 under 35 U.S.C. §102(b) over Earle. The Earle reference addresses the separation of an ionic liquid and a desired product. Let us assume, for the sake of discussion, that a skilled artisan would have considered separation of an ionic liquid and a desired product as being equivalent to purification of an ionic liquid by removing impurities. Applicants, of course, maintain that such an assumption is based purely on hindsight and that a skilled artisan could never have made such an assumption. However, to facilitate discussion, applicants are happy to momentarily assume that a skilled artisan would have considered Earle's desired product as being equivalent to an impurity. Even upon making such an assumption, the examiner can confidently withdraw the rejection, because the claims of the present invention place clear limitations on the "impurity," which the "product" in the Earle reference does not meet.

More specifically new independent claim 22 requires the impurity to be a substance having a vapor pressure in the mixture that prohibits complete removal of the substance by distillation, and/or a substance that interacts with the ionic liquid so as to

prohibit complete removal of the substance by distillation. The Earle reference makes clear, however, that the invention described therein

> allows for the separation of the ionic liquid and product by physical or chemical means such as distillation, steam distillation, azeotropic distillation, sublimation, gravity separation, solvent extraction, crystallization, supercritical fluid extraction and chromatography.[10]

This portion of the Earle reference speaks in terms of "the separation of the ionic liquid and product," and provides no indication that "the separation" is anything less than complete. Indeed, by not quantifying the extent of "the separation" the reference makes clear that complete separation can be achieved.

The examples described in the Earle reference do not contradict this clear teaching that "the separation of the ionic liquid and product" can be a complete separation. Example 4, for instance, relates to the oxidation of ethylbenzene and indicates that "[a]fter 48 hours the [reaction] mixture was analysed by gas chromatography and found to contain ... 23% benzoic acid...."[11] Thereafter, "[t]he products were extracted with diethyl ether..., concentrated on a rotary evaporator and purified by Kugelrohr distillation. This gave ... 18% benzoic acid...."[12] The difference in yields, i.e. 23% benzoic acid versus 18% benzoic acid in no way indicates that "the separation of the ionic liquid and product" was anything less than complete. A skilled artisan would be well aware that other processing issues unrelated to the degree of separation often impact the yield achieved, and therefore, the examples provided no reason for a skilled artisan to doubt that by not quantifying the extent of "the separation" the reference intended to make clear that complete separation of the ionic liquid and product could be achieved "by physical or chemical means such as distillation, steam distillation, azeotropic distillation, sublimation, gravity separation, solvent extraction, crystallization, supercritical fluid extraction and chromatography."[13]

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[10] Paragraph [0008] of US 2004/0015009 A1.
[11] Paragraph [0030] of US 2004/0015009 A1.
[12] Paragraph [0030] of US 2004/0015009 A1.
[13] Paragraph [0008] of US 2004/0015009 A1.

Since the Earle reference clearly indicate that a complete separation of the ionic liquid and their product can be achieved by distillation, Earle's product does not meet the limitations that the present claims put on the impurity to be separated from the ionic liquid. More specifically, Earle's product cannot have a vapor pressure in the (ionic liquid – product) mixture that prohibits complete removal of the substance by distillation, because the Earle reference makes clear that the invention described therein allows for "the separation of the ionic liquid and product ... by distillation."[14] Similarly, Earle's product cannot be a substance that interacts with the ionic liquid so as to prohibit complete removal of the substance by distillation, because the Earle reference makes clear that the invention described therein allows for "the separation of the ionic liquid and product ... by distillation."[15]

35 U.S.C. 102(b) states that "[a] person shall be entitled to a patent unless ... the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States[,]" and it is well-settled that anticipation can only be established by a single prior art reference which discloses each and every element of the claimed invention.[16]

Since the Earle reference in no way discloses a process for purifying a mixture of at least one ionic liquid and at least one impurity, wherein the impurity meets all of the claim limitations, the examiner can conclude that the claimed subject matter is not anticipated by the Earle reference. Applicants, therefore, request that the examiner withdraw this rejection.

The examiner can confidently withdraw the rejection of claims 1 – 3, 8 – 11, 13, 15, 17, 18 and 20 under 35 U.S.C. §103(a) over Earle. It is well settled that "[t]o establish a *prima facie* case of obviousness ... the prior art reference (or references when combined) must teach or suggest all the claim limitations."[17] Since, as discussed above, the Earle reference in no way discloses a process for purifying a mixture of at least one ionic liquid and at least one impurity, wherein the impurity meets all of the claim

[14] Paragraph [0008] of US 2004/0015009 A1.
[15] Paragraph [0008] of US 2004/0015009 A1.
[16] *See, RCA Corp. v. Applied Digital Data Systems, Inc.,* 730 F.2d 1440, 1444 (Fed. Cir. 1984).
[17] MPEP §2143.

limitations, the examiner can conclude that the claimed subject matter is not obviated by the Earle reference. Applicants, therefore, request that the examiner withdraw this rejection.

The examiner can confidently withdraw the following rejections:

- Rejection of claims 1 – 3, 8 – 11, 13, 15, 17, 18 and 20 under 35 U.S.C. §103(a) over Earle in view of Hackh's Dictionary and Kawaki or Thiem. This rejection was made on the premise that "the claims differ from Earle … in the clarity that nitrotoluene is a polar high boiling compound."[18]
- Rejection of claims 2, 6, 7, 9, 12, 18 and 20 under 35 U.S.C. §103(a) over Earle in view of Hackh's Dictionary and Kawaki or Thiem and further in view of Snyder. This rejection was made on the premise that "the claims differ from [the references previously discussed] in reciting use of ion exchange chromatography[,]"[19] or "in reciting use of water as a solvent and reversed phase silica gel."[20]
- Rejection of claims 18 and 20 under 35 U.S.C. §103(a) over Earle in view of Hackh's Dictionary and Kawaki or Thiem and Snyder, and further in view of Mike's Handbook. This rejection was made on the premise that "the claims differ from [the references previously discussed] in the clarity of reciting a resin."[21]
- Rejection of claims 4 under 35 U.S.C. §103(a) over Earle in view of Hackh's Dictionary and Kawaki or Thiem and further in view of Gerhold. This rejection was made on the premise that "the claims differ from [the references previously discussed] in reciting use of a continuous chromatography process."[22]
- Rejection of claims 11, 18 and 20 under 35 U.S.C. §103(a) over Earle in view of Hackh's Dictionary and Kawaki or Thiem and further in view of Wasserscheid. This rejection was made on the premise that "the claims differ

[18] Page 3, paragraph 2 of the present Office action.
[19] Page 4, paragraph 2 of the present Office action.
[20] Page 7, paragraph 2 of the present Office action.
[21] Page 5, paragraph 2 of the present Office action.
[22] Page 6, paragraph 2 of the present Office action.

from [the references previously discussed] in reciting evaporating low boiling compounds."[23]

- Rejection of claims 18 and 20 under 35 U.S.C. §103(a) over Earle in view of Hackh's Dictionary and Kawaki or Thiem and further in view of Wasserscheid and Snyder and Mike's Handbook. This rejection was made on the premise that "the claims differ from [the references previously discussed] in reciting use of a resin."[24]

In light of the discussion above regarding the other novel and unobvious differences between the present invention and the Earle reference, for which the secondary references do not compensate, applicants request that the examiner withdraw these rejections.

Again, applicants are thankful for the examiner's diligent efforts to advance this application to allowance, and request favorable action in this matter.

[23] Page 8, paragraph 2 of the present Office action.
[24] Page 9, paragraph 2 of the present Office action.